

# The Functional State of the Cardiorespiratory System of Athletes Involved in Swimming

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**Abstract** We analyze from this topic is determined by both the theoretical and practical importance of studying the characteristics of the functional state of the cardiorespiratory system of athletes, depending on the specific characteristics of muscle activity during training and competition.

**Keywords** Functional characteristics, Muscle activity, Trained athlete, Reconstruction of the circulatory, Respiratory systems, Arrhythmias due to automatism, Conduction and excitability dysfunction, Cardiorespiratory system

## 1. Introduction

Currently, scientists are interested in studying the physical development and adaptive characteristics of swimmers. The article analyzes the data available in the literature on the functional status of the respiratory system of swimmers at different stages of sports training. It was found that one of the factors limiting the performance of the athlete is the development of the respiratory system, which depends on the amount of incoming oxygen and the body's ability to digest it. The development of these mechanisms depends on age, individual characteristics of the organism (biological maturity), the direction of the learning process and the external environment.

This shows that the respiratory system of swimmers is functionally strong and economical, and in its development is superior to the respiratory system of non-athletes and athletes of other specialties. It is noted that this advantage is associated with many cyclic operations that require constant functional activity of the systems that supply oxygen to the working muscles and, above all, special working conditions, the pressure of hydractiniids under the influence of high heat. water capacity, horizontal position of the body.

Increasing the volume and intensity of training loads in modern sports requires the creation of functional characteristics of athletes depending on the specific characteristics of muscle activity, as well as the period of training. The body's adaptation to intense muscle activity is accompanied by significant changes in the performance of the cardiorespiratory system.

The high performance of the trained athlete is associated with improved adaptation and regulatory mechanisms at all

levels of activity. changes in it. Disorders of the circulatory and respiratory systems, autonomic regulation of heart rhythm can lead to a decrease in the ability to work.

The laws of the reconstruction of the circulatory and respiratory systems, as well as the need for information on the autonomous regulation of heart rhythm of athletes, the formation of functional reserves depending on the training period and the direction of the training process require a comprehensive complex. Studies that allow the assessment and monitoring of the current state, structural and functional shifts of the cardiorespiratory system during the period of adaptation to intense physical stress. problems with central hemodynamics, heart rate variability, external respiration, and electrocardiographic changes have not yet been clearly resolved.

Athletes engaged in cycling, game sports, and martial arts have found common moments of heart rate regulation, which are characterized by increased activity of parasympathetic and humoral effects. Athletes in complex coordination sports have shown a high concentration of heart rate control and the predominance of sympathetic activity. In athletes specializing in coordination sports and martial arts, electrocardiographic changes are considered part of normal physiological adaptation to exercise, but There are changes that require additional exercise. research Arrhythmias due to automatism, conduction and excitability dysfunction are often noted in athletes who specialize in sports.

Multidirectional changes in respiratory system parameters are complex coordination specific to sports athletes and bronchial permeability). Optimal lung ventilation in athletes was ensured by high levels of bronchial permeability in the middle and small bronchi. Athletes specializing in martial arts experience difficulties in pulmonary ventilation, which is associated with body positions, which requires a complex adaptation to the dynamics of respiration. showed sinus bradycardia. in cyclic, game types, and martial arts, the SV score was significantly higher in cyclical and team sports

athletes than in the IOC, respectively. balanced sympathetic and parasympathetic effects in athletes in all groups. Significantly higher regulation of regulatory mechanisms in athletes engaged in team sports. Emphasis on the effect of high autonomic centers on the cardiovascular subcortical center in athletes specializing in team sports, high cerebral ergo tropic activity, which characterizes the low activity of the sympathetic vasomotor need center Significant low levels of regulatory mechanisms were noted among martial arts representatives.

Among athletes specializing in team sports, arrhythmias due to automatism, impaired conduction functions, as in the training period, prevailed, regardless of specialization, the indicators turned out to be the same for athletes. These include, for example, sinus bradycardia found at rest in cyclical, game sports, and martial arts athletes. Others, for example, the components of the IOC - the size of the SV and its relationship to heart rate are specific. Humoral-metabolic effects on heart rhythm, improved respiratory rhythm, improved bronchial permeability. motor-respiratory regulation.

It has been found that the respiratory system of swimmers is characterized by high functional capacity and efficiency, and in many respects the level of development of the respiratory system of non-athletes and athletes of other specialties. It is argued that this advantage is due to the regularity of large-scale cyclical work that requires constant functional activity of the oxygen-supplying systems of the muscles operated by the swimmers and, above all, the influence of the special conditions under which this work is performed. hydrostatic pressure, high heat capacity of water, horizontal position.

The respiratory and cardiovascular systems form an efficient system for transporting oxygen to body tissues and removing carbon dioxide from them. Pulmonary ventilation and diffusion (gas exchange between the lungs and blood) are two processes called external respiration. External and internal respiration are interconnected through the circulatory system.

Numerous studies have shown that the greater the body's ability to absorb oxygen, the higher a person's physical ability. this alone is not enough to achieve high sports results. with high values of external respiration (including lung capacity), the ability to effectively use their capabilities when performing work of different intensities is also important. Sports in the aquatic environment (swimming) has a number of physiological properties. distinguishing it from physical work in normal weather conditions. These properties are determined by mechanical factors associated with movement in water, the horizontal position of the body, and the high heat capacity of water.

In swimming, breathing is coordinated with the movements of the limbs. As a rule, no more than one breath and exhalation is performed in each hand movement cycle. High energy expenditure leads to a great need for oxygen, and therefore the swimmer strives to make the most of every breath. The pressure of the water in the chest promotes

complete exhalation and at the same time promotes the development of muscles that expand the chest. All this leads to an increase in the vital capacity of the lungs (in qualified swimmers this figure reaches 6.5-8 liters and more) and an increase in the functionality of the respiratory system of the swimmer. Spasmodic growth of somatic symptoms.

In the early stages of exercise, the reserves of the external respiratory system change slightly, being within the normal range for children who do not exercise. In children, the effects of respiratory muscle fatigue and hypoxia are formed during swimming. It is important to understand that the dynamics of age-related physical development in young swimmers with different types of biological maturity can be significantly different in the age zones. the highest growth rates, as well as the levels of maturity of somatic, power, and functional indicators that limit swimming speed.

Monitoring the level of biological maturity is important to determine the timing of the onset of intensive strength and functional training, especially in middle-aged age groups.

Vital capacity (VC), wavelength (TR) and minute ventilation (MVL) values are of the greatest practical importance in sports practice. The change in these parameters is mainly due to age and adaptation and increases depending on the variable volume and intensity of training loads. It is a direct indicator of the functionality of the external respiratory system and an indirect indicator of the maximum area. the respiratory surface of the lung where the diffusion of oxygen and carbon dioxide occurs serves as the VC value.

The dynamics of VC and MVL performance is characterized by a significant increase in the development of the aerobic mechanism of energy supply with them and in swimmers between the ages of 14 and 17. Adaptive reactions of the cardiovascular system up to this age. the impact of swimmers on physical loads is inefficient, which is characterized by significant stress in carrying these loads.

Thus, we observe uncertain results of studies conducted by different authors and conclude that the trajectories of VK development in swimmers are individual and significantly different in age dynamics. .-respiratory system, also due to the different levels of participation of these components in ensuring maximum flexibility result. There is a stable relationship between lung capacity values and sports results. 16 to 22 years of age.

The development of the respiratory system is one of the main factors limiting the performance of an athlete, it directly depends on both the amount of oxygen delivered and the body's ability to absorb it. The level of development of these mechanisms depends on age, the individual characteristics of the organism (biological maturity), the direction of the learning process and environmental conditions.

The respiratory system of swimmers is characterized by high functionality and performance, and in many ways exceeds the level of development of the respiratory system of non-athletes and athletes of other specialties. This advantage is due to the fact that swimmers regularly perform large

cyclic work, which requires constant functional activity of the systems that supply oxygen to the working muscles, and the influence of the special conditions in which this work is performed, primarily hydrostatic pressure, high heat capacity of water and a horizontal position of the body.

The study of the resources for the development and adaptation of the respiratory system of swimmers is of great interest to the modern scientific and sports community, which is associated both with the personal interests of individual professionals and with the development strategy of the state. in the field of healthcare - to preserve the health and life expectancy of citizens, in the field of physical culture and sports - to achieve high sports results throughout the world and form a strong sports reserve.

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